51.12 Control strategy

San Diego County will rely on a lead phase-down program for gasoline to achieve the lead standard by 1982 and maintain it thereafter. The lead phase-down program is based on ARB lead content for gasoline regulations and requires that by January 1, 1980 and thereafter the average lead content for gasoline from small refineries (having a gasoline production capacity of less than 20,000 barrels per day) have no more than 1.4 grams of lead per gallon of gasoline and from large refineries an average lead content of no more than 0.4 grams per gallon of gasoline. The average lead content must be met for each consecutive three month period beginning on January 1, 1980 and is determined by dividing the total grams of lead used at a refinery in the manufacture of gasoline by the total gallons of gasoline manufactured at that refinery. This indirectly assures that unleaded gasoline will be available for those motor vehicles that require unleaded gasoline. The ARB lead phase-down program for gasoline is as follows:

ARB*	Small Refineries	Large Refineries
1977		1.4 gms/gal
1978		1.0 gms/gal
1979**	1.7 gms/gal	0.7 gms/gal
1980	1.4 gms/gal	0.4 gms/gal

*From California Administrative Code, Title 13, Section 2253

**The ARB will grant waivers of the lead standard until October 1, 1979 to companies whose regular and unleaded octane levels does not exceed 88.0 $(\frac{R+M}{2})$ and whose premium octane level does not exceed 92.5 $(\frac{R+M}{2})$

The Environmental Protection Agency's lead phase-down program is less restrictive than that of the State ARB. It requires that by October 1, 1979 the average lead content of gasoline from large refineries

having a crude oil capacity of greater than 50,000 barrels per day or whose owner has a total owned refinery crude oil capacity of less than 137,500 barrels per day) be no greater than 0.8 grams of lead per gallon of gasoline and by October 1, 1980 be no greater than 0.5 grams of lead per gallon of gasoline. There are no federal requirements for small refiners.

Modified rollback modeling shows a maximum quarterly averaged lead concentration of 1.01 $\mu g/m^3$ in 1982 and 0.931 $\mu g/m^3$ in 1984. These projected values are well under the 1.5 $\mu g/m^3$ standard for lead. A sample calculation is shown in Attachment I.

51.13 Control strategy: Sulfur oxides and particulate matter

This section does not apply to lead SIPs.

51.14 Control strategy: Carbon monoxide, hydrocarbons, photochemical oxidants, and nitrogen dioxide

This section does not apply to lead SIPs.

51.15 Compliance schedules

The requirements of this section will not apply to San Diego County. The San Diego lead SIP does not require control measures for stationary sources of lead emissions. Compliance schedules for such sources are inappropriate.

51.16 Prevention of air pollution emergency episodes

This section does not apply to lead SIPs.

51.17 Air quality surveillance

This section does not apply to lead SIPs.

51.17a Air quality monitoring methods

This section does not apply to air quality monitoring for lead.

51.17b Air quality surveillance: Lead

The San Diego APCD currently operates two lead air quality monitoring sites under contract with the State ARB. These monitors are not sited in accordance with the procedures specified in EPA's "Supplementary Guidelines for Lead Implementation Plans" and therefore, must be relocated. The San Diego APCD will establish at least one neighborhood lead monitoring site and at least one roadway type monitoring site in accordance with the EPA guidelines as expeditiously as practicable, but no later than two years after the date of the EPA Administrator's approval of the lead plan. Until that time lead monitoring will continue at existing sites. The monitoring method currently in use is an EPA reference method for lead. The APCD will continue to use this reference method. The monitors will be operated on a minimum sampling frequency of one 24-hour sample every six (6) days. Sample analysis will be performed by the State ARB for either individual samples or composites of the samples collected over a calendar month or quarter. The analysis will be performed using an EPA reference or equivalent method for lead.

The San Diego APCD will have a description of the monitoring system available for public inspection and submission to the EPA Administrator upon request. The description will include the SOROAD site identification form, the sampling and analysis method and the sampling schedule.

51.18 Review of new sources and modifications

The 1979 State Implementation Plan submitted to the EPA contains a commitment by San Diego County to adopt, by June 1979, an adequate New Source Review (NSR) program which will meet the requirements of Section 110, Parts C and D of the Clean Air Act as amended in 1977. This program will apply to sources emitting criteria pollutants. Pursuant to this commitment, the San Diego APCD is in the process of revising its NSR regulations. These revised regulations will apply to lead emissions and will insure adequate controls on any new, large stationary sources of lead.

51.19 Source surveillance

The requirements of this section will not apply to San Diego County. The San Diego SIP for lead does not require control measures for stationary sources of lead emissions. Monitoring the status of compliance for stationary sources is not applicable.

51.20 Resources

Resources available to the San Diego APCD are (1) federal Comprehensive Employment Training Act (CETA) funds, (2) revenue from APCD permit fees, (3) revenue from miscellaneous APCD fees, (4) local tax-based revenue, (5) ARB subvention funds and (6) EPA grant funds.

Additional resources needed to carry out the San Diego plan during the five-year period following its submission are (1) funds to establish two new air quality monitoring systems for lead and (2) funds to maintain these monitoring stations. The San Diego APCD will negotiate these additional revenue requirements with the State ARB and the EPA.

51.21 Intergovernmental cooperation

The San Diego APCD will submit air quality and emission data to any governmental agency requesting such information.

51.22 Rules and regulations

The requirements of this section will not apply to San Diego County. The San Diego SIP for lead does not require control measures for stationary sources of lead emissions. The adoption of rules and regulations for the control of such sources is not applicable.

51.30 Request for two-year extension

This section does not apply since the lead standard will be attained by 1982.

51.31 Request for 18-month extension

This section does not apply since the primary and secondary lead standards are identical. The APCD will not request an extension for the submission of its lead control plan.

51.32 Request for one-year postponement

The Clean Air Act Amendments of 1977 have rendered this section inapplicable.

51.33 Hearings and appeals relating to request for one-year postponement

This section does not apply since the lead standard will be attained by 1982.

51.34 Variances

This section does not apply since the lead standard will be attained by 1982.

51.80 Demonstration of attainment

There are no primary or secondary lead smelters, primary or secondary copper smelters, lead gasoline additive plants, lead-acid storage battery manufacturing plants or other stationary sources that emit 25 or more tons per year of lead located in San Diego County. A control plan which relies on gasoline lead phase-down has been shown to achieve the national lead standard in those areas where measurements have shown that the standard has been exceeded. The national lead standard will be attained by 1982 and will be maintained at least through 1984.

Modified rollback modeling as described in the EPA "Supplementary Guidelines for Lead Implementation Plans" was used to determine the impact of the gasoline lead phase-down program on air quality. Equation 27 (page 108) of Appendix G was used to determine maximum future lead concentrations and thus whether the lead standard will be attained and maintained in future years. Motor vehicle miles travelled (VMT) projections were obtained from the San Diego Air Quality Maintenance Plan. It was assumed that area source and stationary source lead emissions will remain constant for the years under consideration (1976, 1982 and 1984). A background level of 0.01 $\mu g/m^3$, given by the ARB, was used. A maximum measured lead concentration of 3.25 $\mu g/m^3$ (1976) was used. All other input data was obtained from the ARB.

Lead emissions were calculated to be 3.125 tons/day for the base-line year 1976, 0.972 tons/day for 1982 and 0.923 tons/day for 1984. Motor vehicle lead emissions data for all years was provided by the ARB. Emissions projections for 1982 and 1984 reflect the gasoline lead phase-down program.

Maximum quarterly averaged air quality levels expected to result from the application of the gasoline lead phase-down program, calculated using the modified rollback method are as follows:

	1976 (measured)	1982	1984
$C_{max.}$	3.25 $\mu g/m^3$	1.01 $\mu g/m^3$	0.931 $\mu g/m^3$

A sample calculation for 1982 is contained in Attachment I.

51.81 Emissions data

There are no point sources located in San Diego County that emit five (5) or more tons of lead per year. The emissions inventory (tons/day) for major source categories in the baseline year (1976) and projected for 1982 and 1984 is as follows:

	1976	1982	1984
light-duty passenger vehicles (T/day)	2.259	0.487	0.357
light-duty trucks (T/Day)	0.479	0.137	0.126
medium-duty trucks (T/Day)	0.076	0.028	0.026
heavy-duty trucks (T/Day)	0.246	0.258	0.349
motorcycles (T/Day)	0.012	0.009	0.012
area sources (T/Day)	0.049	0.049	0.049
stationary sources (T/Day	0.004	0.004	0.004
TOTAL (T/Day)	3.125	0.972	0.923

The emissions inventory shown above assumes that the stationary source contribution to total lead emissions will remain constant for future years. Baseline (1976) stationary source emissions were determined by contacting all known lead emission sources in San Diego County to determine the nature and amount of lead usage. Emission factors were then applied pursuant to an ARB to San Diego APCD letter of November 16, 1977 "Guidelines for Submitting Lead Emissions Data". Lead emissions data from vehicular sources for all years was supplied by the ARB.

51.82 Air quality data

All lead air quality data measured in San Diego County from January, 1974 to December 31, 1978 has been summarized and is included in Attachment II.

Lead air quality samples are gathered by the San Diego APCD from the Downtown and El Cajon monitoring sites and are sent to the ARB for analysis. Comments relative to the reliability of the data analysis will be provided by the ARB. The spatial scale of representativeness of both monitoring stations are best described as neighborhood as defined by the EPA. Lead levels measured at these locations can be considered as generally representing areas of several city blocks with dimensions in the 0.5 to 4.0 kilometer range.

A tabulation showing the maximum air quality concentrations, based upon projected emissions, has been provided in section 51.80.

51.83 Certain urbanized areas

The requirements of this section are not applicable to San Diego County. There have been no quarter mean measured lead concentrations in excess of 4.0 $\mu g/m^3$ measured in San Diego County.

51.84 Areas around significant point sources

The requirements of this section are not applicable to San Diego County. There are no primary or secondary lead smelters, primary or secondary copper smelters, lead gasoline additive plants, lead-acid storage battery manufacturing plants or other stationary sources that emit 25 or more tons of lead per year located in San Diego County.

51.85 Other areas

The modified rollback modeling technique, as described in the EPA publication "Supplementary Guidelines for Lead Implementation Plans", was used to demonstrate attainment of the lead standard for each area in the vicinity of an air quality monitor that has recorded lead concentrations in excess of the quarterly averaged 1.5 $\mu g/m^3$ national standard concentration. Results are presented in section 51.80.

51.86 Data bases

(a) The requirements of this section are not applicable to San Diego County. San Diego County is not an interstate region.

(b) Emissions data related to motor vehicle sources of lead has been presented in tabular form in section 51.81. All stationary source lead emission data is provided in Attachment III. There are no stationary sources of lead emissions over five (5) tons per year.

(c) All lead air quality data measured since January, 1974 has been previously provided to the ARB. The ARB will transmit this data in the appropriate format to the EPA.

51.87 Measures

The Lead State Implementation Plan for San Diego County will rely on the State ARB's gasoline lead phase-down program. The plan will not emplcy any stationary source control measures. The implementation and enforcement of the gasoline lead phase-down program will be the responsibility of the ARB.

51.88 Data availability

All detailed data and calculations used in the preparation of the lead analyses and plan will be retained by the San Diego APCD and will be made available for public inspection or submittal to the EPA Administrator upon request.

ATTACHMENT I

SAMPLE MODIFIED ROLLBACK CALCULATION FOR 1982

Equation 27 (page 198) of the EPA "Supplementary Guidelines for Lead Implementation Plans" is used to give maximum lead concentration (C_{max}) in a future year given expected growth and emission factors. Equation 27 is as follows:

$$C_{max} = b + (C_{max\text{-}base} - b) \sum \left[(fr_j)_{base} \, gf_j ef_j \right]$$

where b = irreducible background concentration of lead

$C_{max\text{-}base}$ = maximum measured lead concentration

$(fr_j)_{base}$ = fractional contribution of lead emission category to total lead emissions

gf_j = growth factor

ef_j = emission factor = $\frac{\text{(allowable emission per unit of population)}}{\text{(emissions per unit at time of measuring } C_{max})}$

The growth factor term, gf_j, may be eliminated since emission factor, ef_j, already includes a growth factor.

ef_j may be represented by:

$$\frac{\left[\frac{Pb_n T}{fn,s}\right]_{\text{future year}}}{\left[\frac{Pb_n T}{fn,s}\right]_{\text{baseline year}}}$$

where Pb_n = probable pooled average lead content of gasoline in year n (gms/gal)

T = average daily traffic = vehicle miles travelled (VMT) when calculating automotive emissions as an area source.

fn,s = average fleet fuel economy for calendar year n and speed s.

Substitution into Equation 27 yields:

$$C_{max} = b + (C_{max\text{-}base} - b) \sum \left[(fr_j)_{base} \times \frac{\left[\frac{Pb_n T}{fn,s}\right]_{\text{future year}}}{\left[\frac{Pb_n T}{fn,s}\right]_{\text{baseline year}}} \right]$$

Lead Emissions (T/Day) and fr_j:

	1976	fr_j	1982	1984
LDP	2.259	(.72)	0.487	0.357
LDT	0.479	(.153)	0.137	0.126
MDT	0.076	(.024)	0.028	0.026
HDG	0.246	(.08)	0.258	0.349
MCY	0.012	(.004)	0.009	0.012
AREA	0.049	(.016)	0.049	0.049
POINT	0.004	(.001)	0.004	0.004
TOTAL (T/Day)	3.125		0.972	0.923

VMT ($\times 10^5$)	1976	1982	1984
LDP	19.668	25.680	27.9
LDT	3.413	4.576	4.931
MDT	0.382	0.513	0.544
HDG	0.607	0.84	0.926
MCY	0.207	0.297	0.323

NOTE: VMT projections were obtained from the San Diego Air Quality Maintenance Plan

pb_n (from ARB; lead content, gm/gal)

	1976	1982	1984
LDP	1.517	0.286	0.2
LDT	1.464	0.331	0.277
MDT	1.955	0.551	0.469
HDG	1.57	1.288	1.556
MCY	2.06	1.288	1.556

(From ARB; average fleet fuel economy, mpg)

	1976	1982	1984
LDP	14.723	18.0507	20.1367
LDT	14.7498	16.339	16.6209
MDT	10.6	10.6	10.6
HDG	5.7	5.7	5.7
MCY	50.0125	50.0125	50.0125

for 1982 we will first calculate $\Sigma \left[(fr)_{base} \frac{\left[\frac{Pb_n T}{fn,s}\right]_{future}}{\left[\frac{Pb_n \bar{T}}{fn,s}\right]_{base}} \right]$

LDP: $0.72 \times \frac{\frac{(.286)(25.68)}{(18.0507)}}{\frac{(1.517)(19.668)}{(14.723)}} = 0.145$

LDT $0.153 \times \frac{\frac{(.331)(4.576)}{(16.339)}}{\frac{(1.464)(3.413)}{(14.7498)}} = 0.043$

MDT $0.024 \times \frac{\frac{(.551)(.513)}{(10.6)}}{\frac{(1.955)(.382)}{(10.6)}} = 0.009$

HDG $0.08 \times \frac{\frac{(1.288)(.84)}{(5.7)}}{\frac{(1.57)(.607)}{(5.7)}} = 0.09$

MCY $0.001 \times \frac{\frac{(1.288)(.297)}{(50.0125)}}{\frac{(2.06)(.207)}{(50.0125)}} = 0.001$

AREA $.016 \times \frac{1}{1} = 0.016$

STATIONARY $.001 \times \frac{1}{1} = 0.001$

$\Sigma = 0.305$

$b = 0.02\ \mu g/m^3$

$C_{max\text{-}base} = 3.25\ \mu g/m^3$

$C_{max_{1982}} = 0.02 + (3.25 - 0.02)(0.305) = \underline{1.01\ \mu g/m^3}$

SUMMARY OF SAN DIEGO AIR QUALITY MONITORING DATA FOR LEAD
1974 - 1978

Year	Location	1 Quarter	2 Quarter	3 Quarter	4 Quarter
1974	El Cajon	1.13	.71	1.11	1.69*
	Downtown	1.59*	.52	.56	1.48
1975	El Cajon	2.01*	.96	1.51*	2.27*
	Downtown	2.07*	.62	.79	1.90*
1976	El Cajon	2.25*	1.21	1.17	3.25*
	Downtown	2.08*	.49	.64	3.06*
1977	El Cajon	2.27*	.88	1.20	2.99*
	Downtown	2.45*	.52	.54	2.70*
1978	El Cajon	1.42	.87	1.08	2.26*
	Downtown	1.46	.67	.68	1.69*

* = exceeded lead standard of 1.5 $\mu g/m^3$

ATTACHMENT III

LEAD EMISSIONS INVENTORY - SAN DIEGO COUNTY SOURCES

Prepared by San Diego County Department of Air Pollution Control - January 1978

(Based on 1976 Data)

Industry/Activity	Facility	Source	Throughput (tons/yr) (1)	Emission Factor (2)	Emissions (tons/yr)	Comments
Petroleum Marketing	Gasoline Service Stations	--	540 x 10^6 gal	0.87 lb/10^6 gal	0.23	Throughput represents deliveries through San Diego Pipeline only. Truck deliveries not known. Emission factor, according to ARB, represents uncontrolled emissions from all transfers at the service stations only.
Secondary Lead Smelting	GD/Convair, Lindbergh Field	1 lead melting pot	3			No emission factors for lead melting pots are given in the ARB guidelines; emissions are stated to be insignificant compared to those from blast or reverberatory furnaces, therefore no emissions are shown.
	Rohr, Chula Vista	5 melting pots	1,027			
	Solar, Pacific Highway	2 lead melting pots	2			
	Teledyne-Ryan, Harbor Drive	3 lead melting pots	93			
	Aco Metal	1 lead melting pot	5			
	Ametek Straza	3 lead melting pots	4			
	National Steel & Shipbuilding	13 lead melting pots	25			
	Naval Air Rework Facility, North Island	1 lead melting pot	117			
	Stevens Air Systems	1 lead melting pot	150			

LEAD EMISSIONS INVENTORY - SAN DIEGO COUNTY SOURCES

Prepared by San Diego County Department of Air Pollution Control - January 1978

(Based on 1976 Data)

Industry/Activity	Facility	Source	Throughput (tons/yr)(1)	Emission Factor(2)	Emissions (tons/yr)	Comments
	Industrial Metals and Salvage	1 lead sweat furnace	100			
	San Diego Gas & Electric	1 lead melting pot	less than 1			
Brass and Bronze Production	National Steel & Shipbuilding	1 yellow brass melting furnace	36	13.2 lb/ton	0.24	
	Naval Station, San Diego	bronze foundry	0	50 lb/ton	0.20	
	National City Foundry	2 yellow brass melting furnaces	30	13.2 lb/ton	0.20	
	CH & N Pattern Shop	red & yellow brass furnace	5	13.2 lb/ton	0.03	
Gray Iron Production	Industrial Castings	gray iron foundry	900	0.6 lb/ton	0.27	
Iron & Steel Production	Perfecto Cast	2 stainless and mild steel induction furnaces	200	0.22 lb/ton	0.02	Particulate emissions controlled by baghouse whose efficiency in removing lead particulates is unknown, therefore uncontrolled emissions only are shown.
	National Steel & Shipbuilding	2 iron melting cupolas	592	0.2	0.06	Particulate emissions controlled by baghouse whose efficiency in removing lead particulates is unknown, therefore uncontrolled emissions only are shown.

LEAD EMISSION INVENTORY - SAN DIEGO COUNTY SOURCES

Prepared by San Diego County Department of Air Pollution Control - January 1978

(Based on 1976 Data)

Industry/Activity	Facility	Source	Throughput (tons/yr)(1)	Emission Factor (2)	Emissions (tons/yr)	Comments
Type Metal Industry	Deluxe Check Printers	1 type metal melting pot	75	0.25 lb/ton	0.01	
	Neyenesch Printers	1 type metal melting pot	50	0.25 lb/ton	0.01	
	Arts & Crafts Press	1 type metal melting pot	46	0.25 lb/ton	0.01	
Combustion of Fuels	San Diego Gas & Electric	Encina	$234{,}518 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	0.07	SDG&E does not analyze fuel for lead, therefore, ARB default of 0.29 has been assumed for liquid fuel. Throughputs include both residual and distillate fuel insig is less than 0.01 ton/yr.
		South Bay	$199{,}030 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	0.06	
		Silvergate	$14{,}868 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		Station "B"	$2{,}374 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		Applied Energy	381×10^3 gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		Naval Training Center	$2{,}746 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		El Cajon	95×10^3 gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		Miramar	379×10^3 gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		Kearny	$1{,}015 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
		Division	192×10^3 gal	$(4.2)(0.14)$ lb/10^6 gal	insig	
	Boilers, excluding SDG&E boilers		$62{,}000 \times 10^3$ gal	$(4.2)(0.14)$ lb/10^6 gal	0.09	Throughput derived from 1974 emissions inventory data. Includes both residual and distillate fuel.
			$32{,}944 \times 10^3$ gal	$(4.2)(.00001)$ lb/10^6 gal	insig	

(1) Unless otherwise indicated

(2) Emission factors taken from ARB Guidelines for submitting lead emissions data.

TOTAL LEAD EMISSIONS - 1.50 tons/yr

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

June 4, 1979

Mr. Paul DeFalco
Administrator
Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, California 94105

Dear Mr. DeFalco:

On October 5, 1978, the EPA promulgated a national ambient air quality standard for lead. The promulgation required that the State Implementation Plan be revised to show attainment of the standard by 1982. On January 26, 1979, we submitted to you a lead emission inventory, projected reductions, analytical methods, a copy of this District's lead regulation, and the location and frequency of lead monitoring. On April 27, 1979, you indicated the District should prepare supplemental data showing the attainment and maintenance of the Air Quality Standard by 1982.

In order to fulfill your request, we have enclosed INFORMATION BULLETIN 4-4-79, ATMOSPHERIC LEAD IN THE SAN FRANCISCO BAY AREA, 1970-1978. Please consider this document as part of our work program.

Summarizing, the District has had a lead regulation since November 1971. It was adopted after duly published public hearings before our Board of Directors. The regulation establishes clear and legally enforceable limits, more than three times as stringent as those proposed by the EPA.

The Bay Area has no stationary lead sources as defined by CFR 51.1(k)(2). Attainment of the Air Quality Standard for lead will depend on the State and Federal programs for reducing lead in gasoline. This control strategy does not come within the jurisdiction of the District.

Mr. Paul DeFalco

June 4, 1979

Since the lead regulation was adopted in 1971, I would like to suggest that Division 12, Regulation 2 be evaluated by your agency as part of our original SIP. We also request consideration of this regulation under 40CFR 51.87(a)(2).

I hope this information fulfills the District's grant requirement under program objective six. Should you have any questions, please have your staff contact Mr. Peter Hess of this office.

Sincerely yours,

Milton Feldstein
Air Pollution Control Officer

MF:tmh
cc: Gary Agid
CARB

Enclosures (4)

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

INFORMATION BULLETIN 4-4-79

ATMOSPHERIC LEAD IN THE SAN FRANCISCO BAY AREA, 1970-1978

TECHNICAL SERVICES DIVISION

SUMMARY

Atmospheric lead concentrations measured in the Bay Area since 1970 are summarized in this bulletin, particularly with respect to the California State standard of 1.5 $\mu g/m^3$ per month and the new Federal standard of 1.5 $\mu g/m^3$ per calendar quarter. Both monthly and quarterly lead data show a strong seasonal factor, in phase with carbon monoxide but out of phase with ozone. The "lead season" extends from October through February, with quarterly excesses occurring primarily in winter.

The detailed quarterly data for 1974-78 show that excesses are most frequent at the downtown San Francisco and San Jose monitoring sites. San Rafael, Redwood City, Vallejo and Napa follow in reasonable relationship to arterial traffic exposure of their monitoring sites. The Santa Rosa and Pittsburg stations showed no quarterly excesses. The three community stations with industrial exposure (Pittsburg, Richmond, and Potrero) have relatively low lead values, reinforcing the importance of leaded fuels as the major atmospheric lead source.

The annual lead averages for San Francisco and San Jose over the full nine years of monitoring both show a mean overall downtrend of .12 $\mu g/m^3$ per year; indicating reasonable progress toward standard attainment. The annual fluctuations in lead values, particularly the sharp rise in 1976, would weaken confidence in the overall downtrend if such fluctuation were not readily explainable by weather factors. However, the stability factor, a simple measure of inversion strength, is shown to explain 78% of the variance, and thus to support the validity of the downtrend. Extrapolation of the existing downtrend, particularly with respect to winter quarter data, would suggest attainment of the Federal standard at downtown stations by 1984 under normal weather conditions. Projected rates of decrease in leaded fuel use would suggest even earlier attainment.

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1. Standards and Monitoring

As a matter of public interest and concern, concentrations of atmospheric lead in the Bay Area have been regularly monitored by the Bay Area Air Quality Management District since 1970, when the California Air Resources Board established an air quality standard for lead at 1.5 micrograms per cubic meter ($\mu g/m^3$) monthly average. The lead data for 1970-73 were summarized in Information Bulletin 8-29-74. This report updates the earlier lead bulletin, and covers nine full years of data from which to assess patterns and establish trends.

As of October 5, 1978, the Environmental Protection Agency established a national ambient air quality standard for lead at 1.5 $\mu g/m^3$ averaged over a calendar quarter (Federal Register, Vol. 43, No. 194, pp. 46246-46277). Thus the State and Federal standards set the same lead concentration limits, but EPA concluded that the quarterly averaging period will improve the validity of the air quality data without a significant reduction in protectiveness. As stated in the Federal Register, short-term exposures to elevated air lead have a lessened impact because of the slow rate at which blood levels reequilibrate to changes in air exposure. Also, paints, soils, pesticides, water, and processed foods are important non-air exposure routes which outweigh and lessen the relative impact of air lead exposure.

In establishing the Federal standard, EPA determined that young children (age 1-5 years) were the group most sensitive to lead exposure, and set the 1.5 $\mu g/m^3$ standard to prevent such children from exceeding a blood level of 30 micrograms lead per deciliter of blood, well below the level where the impairment of heme synthesis might begin to occur. The Occupational Safety and Health Administration endorsed the EPA standard, and viewed it as consistent with the proposed OSHA standard for adult workers of 100 $\mu g/m^3$ in an 8-hour time-weighted average.

The Federal reference method is based on measuring the lead content of suspended particulate matter on glass fiber filters using high volume sampling. Twenty-four samples are taken at a recommended interval of six days. The lead is extracted with nitric acid facilitated by heat (or by a mixture of nitric acid and hydrochloric acid facilitated by ultrasonication). Finally, the lead is measured by atomic absorption spectrometry.

2. Sources of Lead Emissions

For 1977 an initial inventory of lead emissions in the District was prepared, with the motor vehicle contribution calculated by the Air Resources Board. These estimates of lead emissions are from 7.9 to 8.5 tons/day, with about 98% from motor vehicles. Of the 2% emitted by sources classed as stationary, most was from gasoline consumption in farm, lawn, and heavy-duty equipment, with only

fractional percent attributable to point sources. There were no industrial sources with lead emissions exceeding 5 tons/year, and only 3 exceeding 1 ton/year. The one major point source of prior record (the Selby smelter) ceased operation early in 1971.

Lead emissions from stationary sources are controlled by Regulation 2, Division 12, adopted by the District Board of Directors in 1971. The ground level limit of 1.0 $\mu g/m^3$ averaged over 24 hours set in this regulation is more stringent than either State or Federal standards. Any new sources seeking permits to operate in the District would be required to comply with this regulation.

3. Monthly Lead Data

Since 1970, lead data for the Bay Area have been reported as monthly averages in compliance with the California State standard. These detailed data by station and month for 1974 through 1978 are given in Appendix Tables A though E. Those cases exceeding the State standard are summarized by month and year in Table 1.

Several sampling procedure changes are relevant to these values. All samples were collected by 24-hour high volume sampling and measured by the AIHL equivalent method. However, most samples prior to 1976 were collected on cellulose rather than glass-fiber filters. Data from cellulose filters have been multiplied by a factor of 1.3, determined by the Air Resources Board as the ratio for cellulose to glass-fiber comparability.

The 1970-73 data, as reported in Information Bulletin 8-29-74, have beem multiplied by 1.3 for comparability with glass-fiber data in the Table 1 summary. Another major variable has been sampling schedule. Lead analysis over the decade has generally performed at 12-day intervals, comparable to the long-term Federal NASN schedule. However, a 6-day interval has generally been used since 1974 at 6 stations with special ARB support (San Jose, Redwood City, Pittsburg, Santa Rosa, Napa, and Vallejo). These 6 stations thus have the wider statistical lead base now recommended by EPA as of 1979.

The monthly summary of lead excesses in Table 1 shows a strong seasonal pattern in lead levels. There is a "lead season" from October through February, corresponding to the "carbon monoxide season", and more importantly to the occurrence of strong surface-based radiation inversions. In contrast, the summer "ozone season" with its elevated subsidence and marine inversions shows generally low lead values. The year-to-year variations will be considered in the trend section.

The geographic distribution of monthly excesses by station for 1974 through 1978 is given in Table 2, with quarterly excesses also given for comparison. For both categories, the downtown

San Francisco and San Jose stations lead strongly in lead excesses. San Rafel, Redwood City, Vallejo and Napa follow in reasonable relationship to arterial traffic exposure of their station sites. The only station with no monthly excesses is the new Saratoga station with data only for 1978. However, the Pittsburg and Santa Rosa stations also show no quarterly excesses. Low Santa Rosa values would be expected, but the Pittsburg station lies frequently downwind of major industrial sources. It is interesting to note that three of the five stations with least lead excesses (Pittsburg, Richmond and Potrero) are the community stations with major industrial exposure.

4. Quarterly Lead Data and Weather Factors

In terms of the new Federal standard, the lead data for 1974-78 are averaged by calendar quarter in Table 3. Q1 is January, February and March; Q2 is April, May, and June; Q3 is July, August, and September, and Q4 is October, November, and December. The seasonality of Bay Area lead excesses shows just as strongly here as in the monthly data. Excesses are strongly concentrated in Q4 and Q1. The only excesses noted for Q2 and Q3 are recorded in downtown San Francisco. With a 12-day rather than 6-day sampling interval (as for San Jose) the San Francisco station shows wider fluctuations more influenced by single very high or low days. (Summer excesses are also reported at a special-site freeway station described in Appendix F.)

The outstanding feature of the quarterly lead data is the extreme and widespread elevation of lead values in the winter quarter (Q4) of 1976. This quarter was the only exceedance of the Federal standard for 7 of the 15 lead stations, and it was the highest quarter of record for every station. As compared with the clean spring (Q2) values of 1974 or 1978, an order-of magnitude meteorological factor appears to be involved.

In an attempt to verify and quantify a meteorological relationship, we correlated the monthly Q4 lead data for 1974-78 with the monthly stability factor. The stability factor is the temperature at 2500 ft. minus that at the surface, representing low-level inversion strength. This factor was developed for our controlled agricultural burning program, and has proven to be our most effective single weather forecasting input, for both ozone in summer and carbon monoxide in winter. San Jose was used as our highest station with a 6-day sampling interval.

The stability factor showed a .89 correlation with lead values, explaining 80% of the (r^2) variance. The monthly high-hour average CO values at San Jose showed a .87 correlation with the lead values, as would be expected for primary contaminants from the same source. The stability factor and carbon monoxide data jointly explain 87% of the (r^2) variance. The strength of this relationship gives high confidence to lead interpolations and projections applying it.

Unfortunately the length of record for lead values or for stability factors would not justify a statistical evalution of the return period for the adverse conditions of the 1976 winter quarter. However, the dry stagnant weather was associated with the worst drought of the century in Northern California. Thus climatologically, rainfall might provide a reasonable surrogate for estimating some periodicities. Over the past two centuries, extreme droughts in the Western States have generally recurred at 20-22 year intervals. Thus a prudent expectation of the next recurrence (with its associated seasonal stagnation) would 1996-98.

5. Trends and Attainment for Lead Standards

One important requirement of the District's Air Quality Maintenance Planning is the assessment of reasonable progress toward clean air goals. The most straightforward means of such assessment is a simple linear regression of annual averages. As shown in Figure 1, regression lines and annual data points are given for our two community monitoring stations with highest lead levels (San Francisco and San Jose) and for an industrial community station with low lead levels (Pittsburg).

The downtown San Francisco and San Jose stations show parallel regression lines with an annual downtrend of .12 $\mu g/m^3$. The Pittsburg station shows a much smaller downtrend (.02 $\mu g/m^3$) more typical of outlying stations. The similarity of the two downtown sites suggests a real decrease most apparent in traffic-saturated areas. The lower rates of decrease in outlying areas suggest the usual balance between increasing traffic and decreasing emissions for a given traffic volume.

The annual fluctuations in lead values, particularly the sharp rise in 1976, would weaken confidence in the overall downtrend, if it were not for the strong correlation of lead with stability factor noted earlier. If a simple weather factor can explain 80% of such variance, one can readily develop a normalized trend study with reasonable confidence.

Annual variations of vehicular lead emissions over the data period are not available, but estimates and projections for the South Coast air basin (given in the South Coast Air Quality Management District's report E & P 78-4, Airborne Lead) should be applicable in general terms. The South Coast basin shows a decrease from 24 tons of lead per day in 1970 to 14 T/D in 1976, and projects a further decrease to 3 T/D by 1983. This projection would imply a rapid attainment of both Federal and State standards.

More conservatively, one might project only on the presently observed downtrend. The annual values do not directly indicate quarterly excesses, but it is reasonable and conservative to apply the overall .12 $\mu g/m^3$ downtrend to the worst quarter (Q4) at the worst community station for a year of favorable weather (1978), and worst-case weather (1976). Such projections would suggest

attainment of the Federal standard by 1980 with favorable weather, by 1984 with normal weather, and by 1995 with worst-case weather. With the accelerated decrease in leaded-fuel use as projected by SCAQMD, the lead standard should be attained in the mid-1980's even for worst-case weather.

That school districts work with the Department of Health Services to mitigate the effects of [illegible]

That local and county planning agencies separate a [illegible] check before the future location of pre-schools, nurseries, kindergartens, primary schools, and parks and playgrounds for young children is decided upon. In locations of high soil and/or air concentrations of lead, the location should be denied or effective mitigation measures implemented;

That the Department of Health Services develop educational materials to give to parents in areas with high concentrations of lead so that they may protect their children from [illegible] in their yards and school [illegible]

I certify that the above [illegible] and adopted [illegible] Resolution [illegible] passed by the [illegible]

[illegible]
Secretary

BE IT FURTHER RESOLVED, that the Board requests from EPA a two year extension of the lead standard attainment date for the Los Angeles County portion of the South Coast Air Basin and the Fresno County portion of the San Joaquin Valley Air Basin pursuant to the requirements of Clean Air Act Section 110(e);

BE IT FURTHER RESOLVED, that the Board requests Fresno County Air Pollution Control District, the Council of Fresno County Governments, the Southern California Association of Governments, and the South Coast Air Quality Management District, in cooperation with other appropriate local agencies and the ARB staff, to conduct microscale analyses and if such analysis shows additional control measures are needed for attainment of the lead standard by 1984, to develop and implement sufficient control strategies to attain the NAAQS for lead in "hot spot" locations within their jurisdictions as expeditiously as practicable and no later than October 5, 1984;

BE IT FURTHER RESOLVED, that the Board authorizes the Executive Officer to submit the new analysis to the Environmental Protection Agency as a revision to the State Implementation Plan;

BE IT FURTHER RESOLVED, that the strategies referred to above should be submitted to the ARB by December 1981, and that the Executive Officer shall assist local and regional agencies in strategy development by providing to them, by December 1979, reports on preliminary ARB modeling efforts for Lennox, in Los Angeles County, and Olive Street, the City of Fresno, in Fresno County;

BE IT FURTHER RESOLVED, that the Board requests the remaining nonattainment lead agencies to review the lead control strategy in their areas to insure progress toward attainment of the standard, to incorporate additional local controls if needed, and to coordinate those controls with compatible controls for other pollutants;

BE IT FURTHER RESOLVED, that the Board recommends the State Department of Health and other local agencies in areas with historically high concentrations of lead, consider taking the following actions to reduce exposure to existing high concentrations of lead:

That the State Department of Health Services continue its lead screening program and work with local health agencies, regional transportation planning agencies, and local traffic engineers to map the locations of estimated high concentrations of lead;

That school districts identify schools for kindergarten and primary school age children located in presently or historically high lead areas and should have tests done at these sites to determine the present concentrations of lead in the soil;

WHEREAS, Clean Air Act Section 110(e) allows the Administrator of EPA to extend for a period of not more than two years the date by which the primary standard must be attained upon application of the Governor and upon a determination that despite implementation of reasonably available measures to all emission sources, the necessary technology or other alternatives are not available or cannot be implemented soon enough to permit compliance within the three-year period;

WHEREAS, the Clean Air Act and implementing regulations promulgated by the EPA require that SIP revisions be adopted after a public hearing for which 30 days public notice has been provided;

WHEREAS, the Board finds:

That a public hearing has been held in accordance with the requirements of the Clean Air Act and the provisions of the California Administrative Procedure Act (Government Code Section 11371 et seq.);

That the NAAQS for lead is presently exceeded in the South Coast, San Joaquin Valley, Sacramento Valley, San Francisco Bay Area, San Diego, and South Central Coast Air Basins;

That the NAAQS for lead is projected to be attained by 1982 throughout California without the necessity for additional controls due to the gradual reduction in the lead content of gasoline required by existing state regulations, except for portions of the South Coast and San Joaquin Valley Air Basins;

That the development and application of all reasonably available alternative means of attaining the standard are required by the SIP revision but will not permit compliance in the South Coast and San Joaquin Valley Air Basins by 1982 due to the impossibility of implementing certain measures in those [illegible] in the time available;

That [illegible] attainment of the NAAQS for the South Coast and San Joaquin Valley Air Basins is justified;

NOW, THEREFORE, BE IT RESOLVED, that the Board amends the SIP, Chapter 27, California Lead Control Strategy, as proposed in ARB staff report No. 79-22-2, dated August 27, 1979, as revised today, and directs the Executive Officer to submit Chapter [illegible] as revised;

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to include the gasoline lead phasedown regulations, as set forth in California Administrative Code Sections 2252 and 2253.1, as announced pursuant to Resolution 79-75 (September 27, 1979) as part of the Chapter 27 SIP submittal to EPA.

State of California
AIR RESOURCES BOARD

Resolution 79-67

September 27, 1979

WHEREAS, Section 39602 of the Health and Safety Code designates the Air Resources Board (ARB) as the air pollution control agency for all purposes set forth in federal law and designates the ARB as the state agency responsible for the preparation of the State Implementation Plan (SIP) required by the Clean Air Act;

WHEREAS, Section 110(a)(1) of the Clean Air Act as amended requires revision of the SIP within nine months of the promulgation of a national ambient air quality standard to provide for the attainment and maintenance of said standard;

WHEREAS, the federal Environmental Protection Agency (EPA) promulgated a national ambient air quality standard for lead on October 5, 1978;

WHEREAS, the national ambient air quality standard (NAAQS) for lead is based on the effects of lead on the most sensitive age group -- children between the ages of 1 and 5;

WHEREAS, the Board, at public hearings on November 3 and 4, 1975 found substantial evidence of adverse health effects attributable to particulate lead in the atmosphere at concentrations above 1.5 micrograms per cubic meter (30 day average) and also recognized the particular sensitivity of young children to concentrations of lead above the ambient standards;

WHEREAS, a recent study by the Department of Health Services has indicated that in certain areas of the South Coast Air Basin, 20 percent of the children have elevated levels of lead in their blood;

WHEREAS, there are areas in the South Coast Air Basin that have had excessive ambient levels of lead for several years, which are not projected to attain the standard by 1982 and these high concentrations over long periods have resulted in high concentrations of lead in the soil near heavy traffic areas;

WHEREAS, Clean Air Act Section 110(a)(2)(A) requires the SIP revision to provide for attainment of the primary standard within three years from the date of EPA approval of the revision and for attainment of the secondary standard within a reasonable time except under the specific circumstances set forth in Section 110(e) of the Clean Air Act;

Appendix F

Air Resources Board Resolution

Copies of the proposed SIP revision and the accompanying staff report on this matter may be obtained at the Air Resources Board Public Information Office, 1102 Q Street (P. O. Box 2815), Sacramento, California, 95812, at least 30 days prior to the public hearing schedule above and at 9528 Telstar Avenue, El Monte, California, 91731.

CALIFORNIA AIR RESOURCES BOARD

Thomas C. Austin
Executive Officer

State of California
AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER THE ADOPTION OF CHAPTER 27 AS A REVISION TO THE STATE OF CALIFORNIA IMPLEMENTATION PLAN FOR THE ATTAINMENT AND MAINTENANCE OF THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR LEAD

NOTICE IS HEREBY GIVEN that the State Air Resources Board (ARB), pursuant to the authority vested by Health and Safety Code Sections 39600, 39602, and 39605, will hold a public hearing, at the time and place specified below.

DATE: September 27, 1979

TIME: 10:00 A.M.

PLACE: State Office Building
350 McAllister Street
Room 1194
San Francisco, California

On October 5, 1978, the Federal Environmental Protection Agency (EPA) adopted a national ambient air quality standard (NAAQS) for lead (43 FR 46246). The new NAAQS for lead is 1.5 micrograms per cubic meter, averaged over a calendar quarter. The Air Resources Board has prepared a proposed revision to the State Implementation Plan (SIP) in response to the federal requirement that states prepare such revisions demonstrating attainment of the standard by 1982 (43 FR 46264). Under certain conditions, states may obtain an additional two years to attain the standards.

The lead NAAQS is presently being exceeded in the following air basins of California: South Coast, San Joaquin Valley, Sacramento Valley, San Francisco Bay Area, San Diego, South Central Coast, and Mountain Counties. The proposed SIP revision projects attainment of the national standard for lead in all areas of the state by 1982, with the exception of Los Angeles and Fresno counties, as a result of the gradual reduction in the lead content in gasoline required by existing state regulations. The proposed SIP revision requests a two year extension for the San Joaquin Valley and South Coast Air Basins to demonstrate attainment, on the basis that the state us using all reasonably available control measures to deal with the lead problem in those counties, and in order to allow local agencies time to develop plans for dealing with the localized problems that remain. For these two air basins, the proposed SIP revision requires the submission of further analyses and control measures for lead by December, 1980. In all other portions of the state where attainment plans are being prepared to satisfy the 1982 federal requirements, the proposed SIP revision recommends that an analysis of progress towards achieving the lead NAAQS be included in those plans.

Appendix E

Air Resources Board Notice of Public Hearing

(3) At least 30 days prior to the hearing, the application for the variance shall be made available to the public for inspection. Interested members of the public shall be allowed a reasonable opportunity to testify at the hearing and their testimony shall be considered.

(4) No variance shall be granted unless all of the following findings are made:

(A) that the applicant for the variance is, or will be, in violation of the requirements established by subdivision (a) or (b) of this regulation;

(B) that, due to unreasonable economic hardship, unavailability of equipment or lack of technological feasibility beyond the reasonable control of the applicant, requiring compliance would result in either (i) an arbitrary or unreasonable taking of property, or (ii) the practical closing and elimination of a lawful business; and

(C) that such taking or closing would be without a corresponding benefit in reducing air contaminants.

(5) Any variance order shall include the date(s) by which compliance with the lead content limitations in subdivision (a) or (b) will be achieved and any other condition(s) including, where appropriate, increments of progress, that the Executive Officer of the Air Resources Board, as a result of the testimony received at the hearing, finds necessary.

(6) If the Executive Officer determines that, due to conditions beyond the reasonable control of the applicant the applicant needs an immediate variance from the requirements established by subdivision (a) or (b) of this section, the Executive Officer may hold a hearing without complying with the provisions of subdivision (f) (2) or subdivision (f) (3) above. No variance granted under the provisions of this paragraph may extend for a period of more than 45 days. The Executive Officer shall maintain a list of persons who in writing have informed the Executive Officer of their desire to be notified by telephone in advance of any hearing held pursuant to this subdivision, and shall provide advance telephone notice to any such person.

(7) Upon the application of any person, the Executive Officer of the Air Resources Board may review and for good cause modify or revoke a variance from the requirements of subdivision (a) or (b) after holding a hearing in accordance with the provisions of this subdivision.

(8) Information obtained by the Executive Officer of the Air Resources Board or his representatives pursuant to this section shall be treated, insofar as its confidentiality is concerned, in accordance with the provisions of Part III, Chapter 1, Subchapter 4, Title 17, California Administrative Code (Sections 90500-91022).

NOTE: Authority cited: Section 39601, Health and Safety Code. Reference: Section 43101, Health and Safety Code and Section 34 of Chapter 957, Statutes of 1975.

History: 1. New section filed 2-25-76; effective thirtieth day thereafter (Register 76, No. 9).

(c) For each 3-month period (January–March, April–June, July–September, October–December) the average lead content per gallon shall be computed by dividing total grams of lead used at a refinery in the manufacture of gasoline by total gallons of gasoline manufactured at such refinery. Appropriate adjustments shall be made for exports and imports of gasoline.

(d) For each 3-month period (January–March, April–June, July–September, October–December) commencing with the period January 1, 1977 through March 31, 1977, each refiner shall submit to the Executive Officer of the Air Resources Board a report showing for each refinery (i) the total grams of lead in lead additive inventory on the first day of the period, (ii) the total grams of lead received during the period, (iii) the total grams of lead in lead additive inventory on the last day of the period, (iv) the total gallons of gasoline produced by such refinery during the period, (v) the average lead content in each gallon of gasoline produced during the period, and (vi) such other information, including data on gasoline imported to or exported from the State, as may be required by the Board to ascertain the lead content of gasoline to be sold, offered for sale, or delivered for sale at retail in California. Reports shall be submitted within 30 days after the close of the reporting period, on forms supplied by the Executive Officer of the Air Resources Board upon request. Such reports shall be subject to audit, upon request by the Air Resources Board.

(e) For each 3-month period (January–March, April–June, July–September, October–December) commencing with the period January 1, 1977 through March 31, 1977, each lead additive manufacturer shall submit to the Executive Officer of the Air Resources Board a report showing the total grams of lead shipped to each refinery by such lead additive manufacturer during the period. Reports shall be submitted within 30 days after the close of the reporting period, on forms supplied by the Executive Officer of the Air Resources Board upon request.

(f) (1) Any refiner who cannot comply with the requirements set forth in subdivisions (a) or (b) of this section because of unreasonable economic hardship, unavailability of equipment or lack of technological feasibility, may apply to the Executive Officer of the Air Resources Board for a variance. The application shall set forth:

(A) the specific grounds upon which the variance is sought;

(B) the proposed date(s) by which compliance with the lead content limitations in subdivision (a) or (b) will be achieved; and

(C) a plan reasonably detailing the method by which compliance will be achieved.

(2) Upon receipt of an application for a variance, the Executive Officer shall hold a hearing to determine whether, and under what conditions and to what extent, a variance from the requirements established by subdivision (a) or (b) of this section is necessary and will be permitted. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 30 days prior to the hearing. Notice of the hearing shall also be published in at least one newspaper of general circulation and shall be sent to every person who requests such notice, not less than 30 days prior to the hearing.

(6) If the Executive Officer determines that, due to conditions beyond the reasonable control of the applicant, the applicant needs an immediate variance from the requirements established by subdivision (a) of this section, the Executive Officer may hold a hearing without complying with the provisions of subdivision (d) (2) or subdivision (d) (3) above. No variance granted under the provisions of this paragraph may extend for a period of more than 45 days. The Executive Officer shall maintain a list of persons who in writing have informed the Executive Officer of their desire to be notified by telephone in advance of any hearing held pursuant to this subdivision, and shall provide advance telephone notice to any such person.

(7) Upon the application of any person the Executive Officer of the Air Resources Board may review and for good cause modify or revoke a variance from the requirements of subdivision (a) after holding a hearing in accordance with the provisions of this subdivision.

NOTE: Authority cited: Section 39600 and 39601, Health and Safety Code. Reference: Sections 43013 and 43101, Health and Safety Code.

History: 1. Amendment of NOTE filed 3-16-77; effective thirtieth day thereafter (Register 77, No. 12). For prior history, see Register 76, No. 10.
2. Amendment of subsection (a) filed 12-4-78; effective thirtieth day thereafter (Register 78, No. 49).

2253. **Lead Content.** (a) In the manufacture of gasoline to be sold, offered for sale, or delivered for sale at retail in California, no gasoline refiner shall exceed the average lead content per gallon specified below for each 3-month period (January–March, April–June, July–September, October–December):

Effective Date of Limitation	*Maximum Lead Content (Grams Per Gallon)*
January 1, 1977	1.4
January 1, 1978	1.0
January 1, 1979	0.7
January 1, 1980	0.1

(b) The provisions of subsection (a) of this section shall not be applicable to any refiner with a gasoline production capacity of less than 20,000 barrels per day for the manufacture of gasoline to be sold, offered for sale, or delivered for sale at retail in California, such refiners shall not exceed the average lead content per gallon specified below for each 3-month period in accordance with: April–June, July–September, October–December):

Effective Date of Limitation	*Maximum Lead Content (Grams Per Gallon)*
January 1, 1980	1.7
	1.4

ATTACHMENT A

(h) The Executive Officer may grant to a refiner for a three-month period (January - March, April - June, July - September, October - December) or any remaining portion thereof, a waiver of the requirement of Section 2253(a) or Section 2253(b) if:

1) a state of emergency in gasoline supply for the ~~entire~~ state or ~~the applicable~~ any portion thereof has been declared by the Governor, and

2) the Executive Officer determines that the granting of waivers to all refiners who would be eligible for such a waiver would not interfere with the attainment and maintenance of the National Ambient Air Quality Standard for lead for the period of the waiver. ~~in-the-area-covered-by-the-waiver.~~

Prior to taking action pursuant to this Section (h) the Executive Officer shall consult with the Department of Health regarding the ambient concentrations of lead which the Executive Officer predicts will occur as a result of such action.

(i) The Executive Officer may require conditions on a waiver to enable the Executive Officer to determine the effect of the granting of the waiver and to minimize the adverse effects of the use of higher lead content gasoline.

WHEREAS, testimony received by the Board following public meetings of May 10, 1979 and May 17, 1979 adequately demonstrates to the Board's satisfaction that refiners of motor vehicle fuels, if granted a limited waiver of the current lead requirements, could produce more unleaded and leaded gasoline and thereby ease the critical shortages facing Californians and at the same time reduce the risk to the environment from the adverse results of misfueling;

WHEREAS, a public hearing upon thirty days notice and other administrative proceedings have been held in accordance with the provisions of the Administrative Procedure Act (California Government Code Sections 11371 et seq.);

NOW, THEREFORE, BE IT RESOLVED, that the Board amends Section 2253 of Title 13 of the California Administrative Code by adding Subsections (h) and (i), set forth in Attachment A hereto.

I certify that the above is a true and correct copy of Resolution 79-[illegible] as passed by the Air Resources Board

Sally Rump
Board Secretary

State of California
AIR RESOURCES BOARD

Resolution 79-75
September 27, 1979

WHEREAS, the Air Resources Board, pursuant to Sections 39002, 39003, and 39500 of the Health and Safety Code, is responsible for the control of air pollution from motor vehicles;

WHEREAS, the Air Resources Board, pursuant to Sections 43013 and 43101 of the Health and Safety Code, has been directed to adopt and implement emission standards for the control of air contaminants from motor vehicles;

WHEREAS, the Air Resources Board, pursuant to Section 41511 of the Health and Safety Code, is authorized to adopt regulations requiring action as necessary for the determination of the amount of emissions from any source;

WHEREAS, the Air Resources Board, pursuant to Sections 39600, 39601, and 39605 of the Health and Safety Code, is directed to adopt rules and regulations and do such acts as necessary, including the holding of public hearings, for the proper execution of its powers and duties;

WHEREAS, the California Supreme Court in Western Oil and Gas Association v. Orange County Air Pollution Control District, 14C. 3d 411 (1975), ruled that the Board has the authority to regulate the fuel content of gasoline including lead content, pursuant to the aforesaid provisions;

WHEREAS, the California ambient air quality standard for lead is exceeded by a wide margin in most urban areas of the State, and the primary source of the lead in the ambient air is lead additives in gasoline;

WHEREAS, a state of emergency had been declared to exist in certain counties in the State of California as a result of a severe gasoline shortage;

WHEREAS, the Air Resources Board has reaffirmed its position that lead in the ambient air represents a hazard to the public health and welfare;

WHEREAS, the Board has historically documented that the concentrations of lead in the ambient air are lower during the summer months and through the month of September;

WHEREAS, the Board desires to prevent the misfueling of late model cars designed to run only on unleaded fuel by making more unleaded fuel available;

Appendix D

State of California
Lead Phasedown Regulations
Title 13 Section 2253
California Administrative Code
as amended
adopted September 27, 1979

or less. Directional controls shall be designed to minimize sensitivity to short period wind gusts. In addition to the above provisions, samplers shall be operated and samples shall be obtained in accordance with the specifications given in the Air Pollution Control Association Committee TR-2, Method APM-2.5, published in the "*Journal of the Air Pollution Control Association*," Volume 17, No. 1, pages 17-25, January 1967. High-volume samplers shall be operated at least every third day for a period of 24 hours, beginning at 10:00 PST, and all samplers shall be operated concurrently. Meteorological instruments shall be operated continuously.

§ 12215 ANALYSIS OF SAMPLES FOR LEAD. Lead shall be analyzed on the high-volume filters by appropriate preparation of the filter substrate and atomic absorption analysis or any other equivalent analytical procedure.

§ 12216 ANALYSIS OF DATA. After ten days of sampling have been completed, arithmetic means of lead concentration shall be computed from all samples obtained during that period. Two separate means shall be computed, one for all the background samples and one for all samples influenced by the source. Six means shall be running means, centered on each subsequent 24 hour sample. When the means of the concentrations influenced by the source exceeds the mean of the background concentrations by more than 1.0 $\mu g/m^3$ over the same 30-day period, a violation shall be deemed to have occurred and the limitations of § 12110 shall thereafter be met. *(Adopted by Resolution 685, dated November 5, 1971.)*

DIVISION 13 — PERMITS

§ 13000 Permits. The effective date of this Division 13 shall be on July [illegible], 1972.

§ 13001 The Air Pollution Control Officer may impose any permit condition which he deems reasonably necessary to insure compliance with District regulations. He may require installations of devices for measurement or analysis of source emissions or ambient air quality. *(Adopted May [illegible], 1972; renumbered November 11, 1975 [illegible] November 5, 1975.)*

§ 13002 Authority to Construct. No person shall construct any facility or [illegible] erect, alter or replace any article, machine, equipment or other contrivance, the use of which may cause the emission of air contaminants, or the use of which may eliminate, reduce or control the emission of air

§ 12212 INSTRUMENT SPECIFICATION. High-volume samplers shall be fitted with a control device which will cause the sampler to operate only during those periods when the ambient airflow to the sampler is from a specified sector, as described in the "*Journal of the Air Pollution Control Association*," Volume 19, pages 236-238, 1969. Such instruments shall be sufficiently sensitive to record wind direction and speed of wind at wind speeds of two miles per hour.

§ 12213 INSTRUMENT POSITIONING. The high-volume samplers will be positioned in pairs. One pair shall be positioned upwind and downwind of the emission point along the vector of the most frequent wind direction, determined on the basis of a wind rose as described in "*Some Applications of Statistics to Meteorology*," by Hans Panofsky and Glenn Briar, Mineral Industries Extension Service, Pennsylvania State University, pages 15-16, 1958. A second pair shall be positioned upwind and downwind of the emission point along the vector of the next most frequent wind direction, determined on the basis of a wind rose as described above. The primary and secondary directions shall be determined separately for each of two seasons, November through April and May through October inclusive. Samplers shall be positioned in either of the following methods: (1) In two sets of four, with one set of four for the months of November through April and one set of four for the months of May through October; or (2) In one set of four samplers that may be moved on November first and May first of each year. Samplers shall be positioned at a distance from the emission point that is as close as possible to the distance at which maximum ground level concentrations are predicted by diffusion analysis to occur most frequently. Positioning of samplers shall be determined in consultation with the Control Officer, but in no case shall the location of a sampler be closer to the emission point that the edge of the property on which the emission occurs. The meteorological instruments shall be positioned at a location which is as close as possible to the emission point and which also provides the instrument with a reasonably unobstructed exposure to the flow of air. Positioning of the meteorological instruments shall be determined in consultation with the Control Officer.

§ 12214 INSTRUMENT OPERATION. At each high-volume sampling location, one of the samplers shall be operated to sample background concentrations and the other sampler to sample concentrations influenced by the source. Background concentrations will be assumed to exist whenever the difference between wind direction and the direction from sampling site to source is greater than 22.5°. Concentrations will be assumed to be influenced by the source whenever said difference in directions is 22.5°

§ 12111.3 Such person shall provide at least one recording meteorological station equipped to record wind speed and wind direction, and positioned and operated in accordance with the specifications of Chapter 2, Division 12.

§ 12111.4 Such person shall provide necessary care and maintenance so that the instruments and samplers will function properly and adequately record the lead exposures in the area.

§ 12111.5 Such person shall provide to the Control Officer, during each calendar month, a summary of the data obtained from such instruments and samplers, prepared in accordance with the specifications of Chapter 1, Division 12.

§ 12111.6 Such person shall keep all records obtained as a result of Chapter 1, Division 12, for a period of at least two years, and shall make them available to the Control Officer at his request.

§ 12111.7 Such person shall provide to the Control Officer, upon prior notification by him, high-volume samples for analysis.

§12112 Upon the observation within any 30-day period of any ground level concentration in excess of 3.0 $\mu g/m^3$ above the background level as determined by §§ 12111 through 12111.7, and averaged over 30 days as determined in accordance with Chapter 2, Division 12 emission of lead shall thereafter meet the requirements of § 12110.

§ 12113 Notwithstanding any other limitations of this Division 12, no person shall cause, let, permit, suffer, or allow the emission of lead, or any compound of lead calculated as lead, from any emission point in excess of 15 pounds per day.

Chapter 2

§ 12211 [illegible] This procedure outlines the techniques to be used for atmospheric sampling of ground level lead concentrations in order to fulfill requirements of §§ 12111 through 12111.7

§ 12211 [illegible] Lead concentrations in the atmosphere at ground level shall be determined by discretionally controlled operation of high volume samplers and continuous weighted wind vane located in the area so as to provide with respect to each such source that the lead concentrations in that area will be properly measured.

DIVISION 12 — LEAD REGULATION.

Chapter 1

GENERAL LIMITATIONS

§ 12110 No person shall cause, let, permit, suffer, or allow any emission of lead, or any compound of lead calculated as lead, that will result in a ground level concentration in excess of 1.0 $\mu g/m^3$ averaged over 24 hours. Emission limitations shall be determined by use of formulas 4.1 and 5.13, and from workbook figures 3-3 and 3-9, in *Workbook of Atmospheric Dispersion Estimates*, by D. Bruce Turner, Public Health Service Publication No. 999-AP-26, Revised 1969, published by the U.S. Department of Health, Education and Welfare. In using said equations and figures, a neutral or "D" stability category shall be assumed, a wind shall be assumed that remains throughout the averaging period directed within a 22.5° sector of the compass rose at an average speed of two meters per second, and an ambient air temperature of 293°K shall be assumed.

§ 12111 Any person responsible for the emission of lead may elect to be regulated by the requirements of §§ 12111 through 12111.7 instead of § 12110. Such election shall be made by notifying the Control Officer in writing and complying with all the requirements of §§ 12111 through 12111.7.

§ 12111.1 No person shall cause, let, permit, suffer, or allow any emission of lead resulting in ground level concentrations in excess of 1.0 $\mu g/m^3$ above the background level, averaged over 30 days, as determined in accordance with Chapter 2, Division 12. Background level shall be determined as described in § 12214. This § 12111.1 shall not apply to the ground level concentrations occurring on the property from which such emission occurs, provided such property from the emission point to the point of any such concentration is controlled by the person responsible for such emission.

§ 12111.2 The person responsible for emissions of lead who has elected to be regulated by §§ 12111 through 12111.7 shall provide, install, and maintain not less than four directionally controlled high-volume samplers located in the area surrounding the source. Samplers shall be positioned and operated and samples shall be analyzed for lead content in accordance with Chapter 2, Division 12. Additional samples may be required by the Control Officer to adequately determine ground level concentrations of lead.

ESTIMATED LEAD EMISSIONS FROM VEHICULAR SOURCES

IN THE BAY AREA AIR QUALITY MANAGEMENT DISTRICT

YEAR	NO. OF MOTOR VEHICLES	VMT/Y	LEAD T/D
1975	2,840,604	1.883×10^{10}	8.2
1978	2,934,776	1.936×10^{10}	7.5
979	3,137,911	2.096×10^{10}	4.9
	3,234,500	3.215×10^{10}	3.3

LEAD ANALYSIS

LOCATION AND FREQUENCY

24-HOUR SAMPLE EVERY SIXTH DAY

San Jose	120 N. 4th Street
Santa Rosa	437 Humbolt Street
Vallejo	304 Tuolumne Street
Redwood City	897 Barron Avenue
Napa	2552 Jefferson Street
Pittsburg	503 W. 10th Street

24-HOUR SAMPLE EVERY TWELFTH DAY

Livermore	2131 Railroad Avenue
Burlingame	1229 Burlingame Avenue
Fremont	40733 Chapel Way
San Rafael	524 4th Street
Concord	991 Treat Boulevard
Richmond	1144 13th Street
Gilroy	7671 Monterey Street
Saratoga	12333 Saratoga-Sunnyvale Road
San Francisco	939 Ellis Street
San Francisco	900 23rd Street

LEAD ANALYSIS

LOCATION AND FREQUENCY

24-HOUR SAMPLE EVERY SIXTH DAY

San Jose	120 N. 4th Street
Santa Rosa	437 Humbolt Street
Vallejo	304 Tuolumne Street
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24-HOUR SAMPLE EVERY TWELFTH DAY

Livermore	2131 Railroad Avenue
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Gilroy	7671 Monterey Street
Saratoga	12333 Saratoga-Sunnyvale Road
San Francisco	939 Ellis Street
San Francisco	900 23rd Street

and every twelfth day at ten of the stations. As required by our Federal Grant Agreement Fy-78-79, monthly summaries of this data are routinely submitted to the California Air Resources Board Technical Services Division. Thus, the air quality data requirement set forth in 51.82 has been satisfied.

Enclosed is a copy of AIHL method 54 which is used by this District for lead determination. Equivalency of this method with the EPA reference method has been shown on a comparison basis using atomic absorption spectrometry. A summary of that study is also enclosed.

Division 12, Regulation 2, adopted by this District's Board of Directors, establishes a ground level limit for lead, and further specifies certain monitoring requirements to ensure that those limits are met. The ground level limit set by this section is 1.0 ug/m^3 averaged over 24-hours for those operations not maintaining a ground level monitoring network. For those operators who choose to install and maintain ground level monitors, the limit is 1.0 ug/m^3 above background level averaged over a 30-day period. Requirements for the location of the monitor for the detection of maximum concentration are also contained in this section. It should also be pointed out that the Air Pollution Control Officer is authorized under another section of Regulation 2 to require monitoring at suspect operations should he deem it necessary. The ground level limits imposed by this section not only assures compliance with the proposed ambient air quality standard, but appears to be consistent with the monitoring concept proposed by the EPA in 40 CFR part 51 of October 5, 1978, to be considered at some future date.

In summary, it is anticipated that the ambient air quality standard will be attained with the increase use of unleaded gasoline. This appears to be acceptable strategy since Section 51.1 (n) definition was modified in EPA's promulgation by adding a control strategy which includes the control on prohibition of a fuel or fuel additive used in motor vehicles. Any new point source moving into the District would be required to meet standards lower than those promulgated by the EPA.

If you require any further information in this matter, please call me.

Very truly yours,

H. Brinkley
Director of Enforcement

HB:nb
Enclosures

Ex. Chron.
Mail Source
Brinkley
Nelson, P.
EPA-Oliver

January 26, 1979

State of California
Air Resources Board
1102 Q Street
P.O. Box 2815
Sacramento, California 95812

Attention: Mr. Neal Pickus

Gentlemen:

As discussed in our recent telephone conversation, we are enclosing the following information for the required State Implementation Plan revision for lead as required by our Federal Grant Agreement, Program Objective 006.

a) Lead emission inventory data and projection on mobile sources.

b) AIHL method for the determination of lead.

c) Regulation 2, Division 12 of District regulations.

d) Location and frequency of lead analysis.

There are no point sources of lead emissions as defined in 51.1 (k) (2) currently in operation in the Bay Area Air Quality Management District. Thus, the showing of attainment of an ambient air quality standard in the vicinity of those specific operations as set forth in 51.80 (a) (1) is not applicable. The enclosed mobile lead emission data, as compiled by the California Air Resources Board, indicates an incremental reduction to the year 2000, which is entirely attributable to the increased use of unleaded gasoline.

Areawide monitoring for lead is done at sixteen stations in the Bay Area as shown on the attached list. A 24-hour sample is taken every sixth day at six of these stations

BAY AREA AIR POLLUTION CONTROL DISTRICT

November 6, 1978

U.S. Environmental Protection Agency
215 Fremont Street
San Francisco, California 94105

Attention: Mr. Phil Wondra
Chief, California Air
Management Section

Gentlemen:

Pursuant to the grant agreement between the Environmental Protection Agency and the Bay Area Quality Management District, the following reports are submitted as required by Program Objectives 001 and 006.

Output a. of Program Objective 001 requires that by November 1, 1978 submit to the BAAPCD Board an analysis of SIP revisions which would be required for oxidant covering Group I EPA stationary VOC sources. This was accomplished at the November 1 regular Board meeting with the presentation of the attached report, "Clean Air Act Requirements for submission of New State Implementation Plan - Reasonably Available Control Technology (RACT)." The Board approved the staff analysis and requested that a schedule be presented at the November 15, 1978 Board meeting, at which time the necessary public hearings will be scheduled.

Output a. of Program Objective 006 requires the submission of Emission Inventory data on lead sources which emit more than 5 tons per year or more. We have reviewed all available Emission Inventory information and have found that all lead sources in this District emit less than five tons per year.

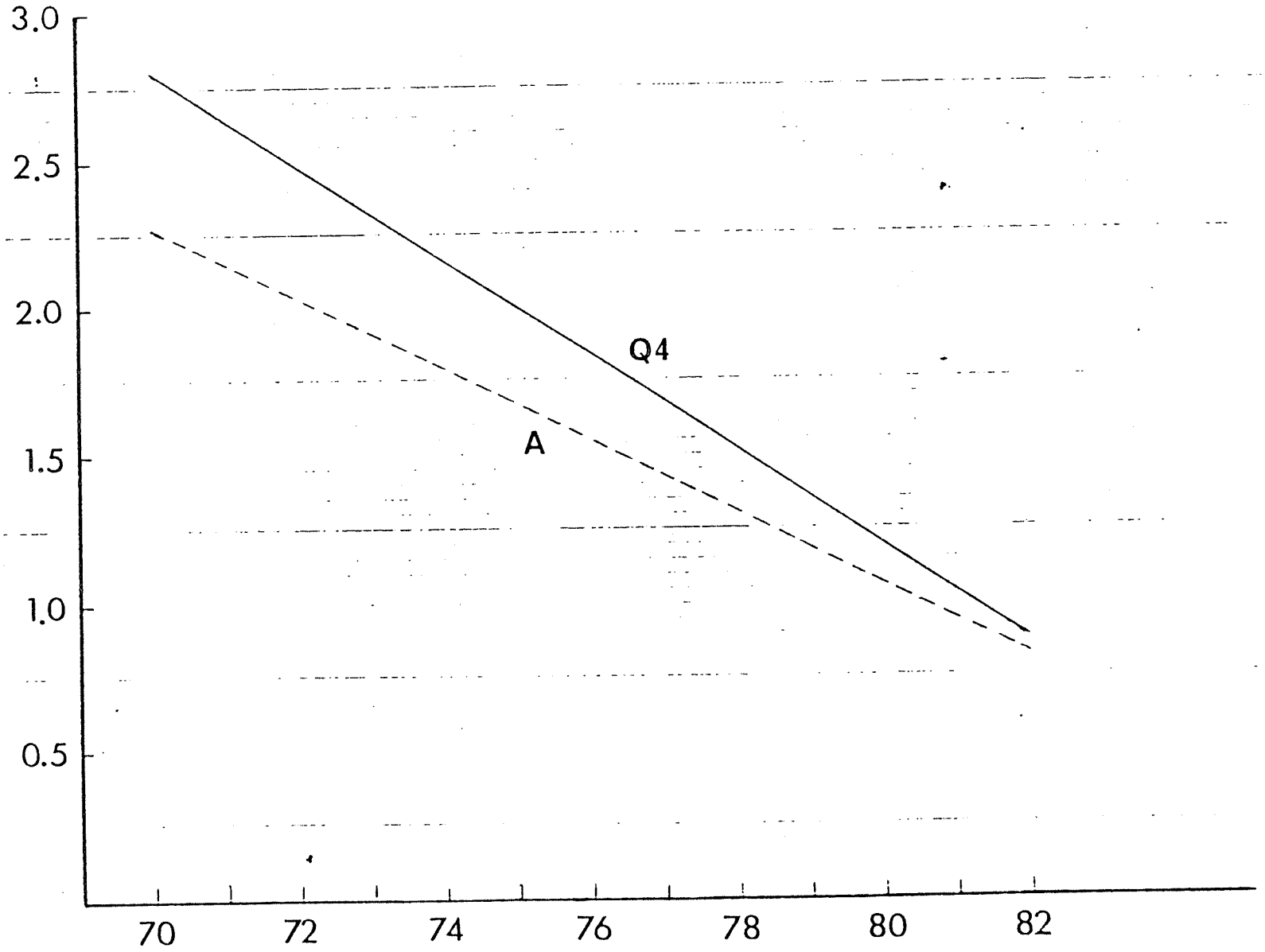
If you require any further information in these matters, please contact H. Brinkley of the District staff.

Sincerely,

M. Feldstein
Deputy Air Pollution
Control Officer

MF:gp

939 ELLIS STREET • SAN FRANCISCO, CALIFORNIA 94109 • (415) 771-6000



Trend lines for lead values (in $\mu g/m^3$) projected to 1982 for the highest Bay Area community lead station (downtown San Francisco). Line A gives the annual average increasing at 0.12 $\mu g/m^3$ per year, and line Q4 gives the fourth (and highest) quarterly average, decreasing at 0.16 $\mu g/m^3$ per year. Even the most adverse weather quarter (Q4) should attain the quarterly lead standard in 1979 under normal weather conditions. The margin of safety for extreme weather conditions by 1982 is nearly a full standard deviation.

APPENDIX F. Special-site monitoring

In addition to the community monitoring reported here, the District has monitored at a special site originally selected as a worst case in relation to the San Francisco International Airport area. This site is at the Millbrae Sewage Treatment Plant, which lies within the Bayshore Freeway (U.S. 101) interchange with Millbrae Avenue and is immediately adjacent to the end of the airport runway most frequently used for take-offs under light wind conditions. The most prevalent wind direction (NW) is parallel to Bayshore Freeway so that a major line source is in effect focused at this point. Moreover, the NE direction is prevalent enough to determine an airport runway orientation, particularly for winter operations, and focuses aircraft and airport automotive emissions at this point. Location within a sewage disposal plant may also add some undetermined factor to the lead burden. (This site was operated as a satellite of our Burlingame station and erroneously identified as the Burlingame Sewage Treatment Plant in Information Bulletin 8-29-74.)

The quarterly and annual data collected at this site are summarized in Table F. With 6 months of no samples and 6 months represented by only one sample in 1974-78 period, the data do not fully justify monthly averages.

TABLE F. QUARTERLY AND ANNUAL ATMOSPHERIC LEAD CONCENTRATIONS (IN $\mu g/m^3$) AT MILLBRAE SEWAGE TREATMENT PLANT

Year	Q1	Q2	Q3	Q4	Annual
1974	2.08	0.98	0.74	2.20	1.55
1975	2.22	1.31	2.07	3.58	2.19
1976	3.48	2.40	2.08	6.43	3.84
1977	2.83	1.53	2.49	5.16	3.12
1978	3.91	N.D.	2.52	2.15	-

The data for this special site are consistently over standard and do not show the downtrend of the community stations. The overall annual data are some 60% higher than the highest community station (downtown San Francisco). A sampling site pinpointed at the intersection of two major line sources, each parallel to a commonly prevailing wind, should be a major factor in these elevated values. Another major factor is the fallout of larger lead particles within 50 meters of vehicular sources, which may account for 40-50% of total mass, as reported by the South Coast Air Quality Management District in their report E & P 78-4, Airborne Lead. Moreover, the lack of downtrend is probably related to the growth of traffic in this area outweighing the decrease of lead for a given traffic volume. For example, the linking of Interstate 380 traffic into Bayshore Freeway early in 1976 is associated with a much higher rate of lead increase than the weather-related increase at downtown San Francisco.

APPENDIX: ANNUAL TABLES OF MONTHLY ATMOSPHERIC LEAD CONCENTRATIONS AT BAAQMD MONITORING STATIONS (LEAD IN $\mu g/m^3$; MONTHLY DATA BASED ON ONLY ONE SAMPLE INDICATED BY PARENTHESES)

E. 1978

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
San Francisco	1.09	0.72	1.03	(1.19)	1.29	0.53	0.97	0.89	1.88	0.93	0.90	1.34	1.06
Potrero	0.76	1.13	0.74	(0.87)	0.51	0.38	0.45	(0.62)	1.30	0.46	1.10	1.17	0.79
San Rafael	0.97	1.22	0.42	0.94	0.54	0.50	0.50	0.66	0.98	0.59	1.06	1.61	0.83
Richmond	0.81	0.73	0.44	0.52	0.41	0.35	0.28	0.42	0.74	0.92	0.92	1.22	0.65
Pittsburg	0.60	0.50	0.37	0.20	0.28	0.20	0.33	0.24	0.52	0.52	0.72	0.96	0.45
Concord	0.76	0.72	0.45	0.38	0.30	0.33	0.50	0.52	0.70	0.49	1.16	1.50	0.65
Fremont	0.79	1.02	0.52	0.75	0.44	0.44	0.62	0.92	1.27	0.76	0.84	1.34	0.81
Livermore	0.84	0186	0.46	0.74	0.39	0.45	0.58	0.50	0.60	0.59	1.05	0.82	0.66
San Jose	1.48	0.61	0.61	0.50	0.60	0.40	0.60	0.52	0.89	1.47	1.45	2.16	0.94
Gilroy	0.91	0.42	0.44	0.20	0.34	0.36	0.39	0.36	0.60	0.50	0.48	1.11	0.51
Saratoga		(0.43)	0.34	0.18	0.28	0.61	0.45	0.57	0.30	0.62	0.38	0.89	0.46
Redwood City	1.24	0.56	0.59	0.34	0.47	0.42	0.46	0.55	0.95	0.99	1.24	1.51	0.78
Burlingame	1.21	(0.28)	(0.16)	(0.20)	0.36	0.25	(0.49)	0.57	0.71	0.45	0.68	1.22	0.55
Santa Rosa	0.66	0.38	0.30	0.32	0.29	0.30	0.31	0.35	0.50	0.71	0.89	1.14	0.51
Vallejo	0.70	0.42	0.41	0.33	0.32	0.22	0.28	0.30	0.64	0.68	0.88	1.50	0.56
Napa	0.83	0.81	0.54	0.60	0.51	0.44	0.44	0.49	0.73	0.94	0.87	1.44	0.72

APPENDIX: ANNUAL TABLES OF MONTHLY ATMOSPHERIC LEAD CONCENTRATIONS AT BAAQMD MONITORING STATIONS (LEAD IN $\mu g/m^3$; MONTHLY DATA BASED ON NOT ONE 24 HOUR INDICATED BY A PARENTHESES)

C. 1976

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
San Francisco	2.06	1.75	1.45	1.94	2.76	1.14	1.18	1.43	2.64	2.55	3.82	2.46	
Potrero	1.18	0.47	0.98	0.62	1.50	0.62	0.36	0.73	1.40	1.16	2.28	0.53	
San Rafael	2.71	1.04	1.46	0.72	1.27	0.47	0.82	1.08	1.60	2.04	(3.39)		
Richmond	0.99	0.37	0.38	0.60	1.02	0.39	0.42	0.70	1.10	1.04	3.10	1.38	
Pittsburg	1.28	0.51	0.76	0.32	0.38	0.24	0.37	0.48	0.50	0.90	0.98	2.11	
Concord	1.76	0.44	0.92	0.56	0.54	0.55	0.45	0.88	1.09	1.51	2.56	1.81	
Fremont	1.89	0.72	1.60	0.79	1.02	0.81	0.77	1.08	1.40	1.06	0.96	3.25	
Livermore	1.50	0.51	1.02	0.78	0.45	0.75	0.60	0.80	1.05	1.50	2.46	2.16	
San Jose	3.92	1.79	1.10	1.18	0.50	1.19	0.62	0.99	1.11	2.63	3.53	5.10	
Gilroy	0.98	0.50	0.63	0.47	0.55	0.43	0.42	0.52	0.80	1.11	1.70	2.13	
Redwood City	2.05	1.16	0.91	0.69	0.47	0.89	0.49	0.68	0.89	1.65	2.38	3.44	
Burlingame	1.93	0.92	0.92	0.64	0.82	0.81	0.67	0.26	1.14	1.18	2.06	2.51	
Santa Rosa	1.58	0.65	0.54	0.58	0.49	0.53	0.31	0.56	0.63	1.12	1.13	1.76	
Vallejo	1.87	0.61	0.45	0.54	0.76	0.50	0.46	0.48	0.69	1.37	2.21	2.19	
Napa	2.54	1.26	0.90	0.93	1.30	1.09	0.65	0.76	1.14	1.66	1.91	3.52	

D. 1977

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
San Francisco	2.16	-	1.50	1.16	0.92	0.98	1.27	0.84	1.06	1.43	1.78	0.72	
Potrero	1.34	0.88	0.97	1.04	0.49	0.55	0.96	0.48	0.53	1.16	0.98	0.78	
San Rafael	2.48	1.68	1.08	0.94	0.79	0.62	0.91	0.77	0.60	1.47	1.14	0.82	
Richmond	1.36	0.76	0.74	0.54	0.58	0.42	0.61	0.42	0.57	0.82	0.99	0.58	
Pittsburg	0.92	1.52	0.33	0.28	0.28	0.36	0.29	0.43	0.38	0.69	0.53	0.80	
Concord	1.55	2.66	0.64	0.38	0.46	0.60	0.62	0.58	0.45	1.08	0.92	1.09	
Fremont	1.82	2.12	0.72	0.55	0.52	0.69	1.09	0.80	0.68	2.04	1.35	1.02	
Livermore	1.28	1.30	0.53	0.52	0.51	0.60	0.80	0.60	0.41	1.58	1.16	0.83	
San Jose	2.58	2.60	1.13	0.79	0.60	0.59	0.97	0.77	0.69	1.17	1.77	1.21	
Gilroy	2.09	1.17	0.67	0.41	0.33	0.34	0.52	1.66	0.41	0.96	1.07	0.78	
Redwood City	1.97	1.79	0.76	0.43	0.47	0.59	0.69	0.69	0.57	0.94	0.90	1.07	
Burlingame	1.84	1.24	0.56	0.28	0.36	0.56	1.02	0.56	0.35	1.04	0.74	1.23	
Santa Rosa	1.08	1.03	0.46	0.32	0.39	0.32	0.38	0.27	0.49	0.71	0.86	0.84	
Vallejo	1.97	1.59	0.55	0.36	0.33	0.43	0.48	0.37	0.49	0.62	0.99	0.83	
Napa	1.68	2.35	0.75	0.48	0.55	0.45	0.58	0.60	0.68	1.13	1.33	0.82	

APPENDIX: ANNUAL TABLES OF MONTHLY ATMOSPHERIC LEAD CONCENTRATIONS AT BAAQMD MONITORING STATIONS (LEAD IN $\mu g/m^3$; MONTHLY DATA BASED ON ONLY ONE SAMPLE INDICATED BY PARENTHESES)

A. 1974

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
San Francisco	2.28	2.66	1.14	0.69	1.14	1.82	0.47	0.74	1.39	3.41	0.88	1.33	1.47
San Rafael	1.60	2.05	1.21	0.55	0.48	0.51	0.34	0.23	0.68	1.88	0.40	0.75	0.89
Richmond	0.99	1.33	0.72	0.22	0.21	0.22	0.18	0.23	0.32	0.65	0.31	0.44	0.48
Pittsburg	0.47	0.74	0.43	0.25	0.17	0.18	0.25	0.26	0.53	0.22	0.61	0.16	0.36
Concord	1.25	1.36	0.53	0.20	0.22	0.22	0.26	0.16	0.94	0.90	0.52	0.23	[illegible]
Fremont	0.99	0.84	1.17	0.46	0.35	0.51	0.49	0.26	1.27	1.38	0.95	0.51	0.76
Livermore	0.82	1.13	0.69	0.49	0.29	0.47	0.40	0.32	1.07	1.17	1.53	0.75	0.76
San Jose	2.17	1.79	0.94	0.34	0.35	0.32	0.55	0.49	1.44	1.34	1.21	0.81	0.98
Redwood City	1.51	2.05	0.55	0.43	0.35	0.48	0.22	0.34	0.58	1.55	0.90	1.07	0.84
Burlingame	1.53	1.42	0.77	0.46	0.25	0.23	0.21	0.04	0.55	1.27	0.60	1.22	0.71
Santa Rosa	0.91	0.79	0.43	0.38	0.34	0.09	0.13	0.13	0.48	0.82	0.42	0.68	0.47
Vallejo	1.96	1.17	0.79	0.55	0.27	0.21	0.22	0.22	0.90	1.92	1.25	0.90	0.86
Napa	1.87	1.12	0.88	0.25	0.25	0.34	0.26	0.29	1.01	1.40	0.86	0.44	0.75

B. 1975

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
San Francisco	2.24	1.68	1.64	0.68	0.54	0.96	1.39	2.07	3.02	1.47	3.15	-	1.71
San Rafael	2.26	0.82	1.13	0.69	0.57	0.31	0.87	0.94	1.42	1.53	3.30	-	1.26
Richmond	0.60	0.38	0.65	0.29	0.21	0.12	0.30	0.52	0.69	0.60	1.31	-	0.53
Pittsburg	0.64	0.10	0.18	0.14	0.16	0.27	0.26	0.38	0.90	0.30	1.09	-	0.4[illegible]
Concord	0.98	0.46	0.39	0.21	0.22	0.25	0.30	0.40	0.79	0.38	1.72	-	0.5[illegible]
Fremont	2.02	0.21	0.47	0.31	0.52	0.60	0.60	0.90	2.91	0.95	2.25	-	1.0[illegible]
Livermore	1.69	0.39	0.29	0.31	0.36	0.51	0.48	0.84	1.36	1.25	1.20	-	0.7[illegible]
San Jose	5.95	1.27	0.87	0.65	0.56	0.65	0.61	1.27	1.34	1.79	2.00	2.89	1.6[illegible]
Gilroy	2.26	0.32	0.41	0.18	0.28	0.27	0.36	0.54	1.19	0.82	1.34	-	0.7[illegible]
Redwood City	2.04	0.18	0.77	0.42	0.58	0.47	0.43	0.53	1.55	0.82	1.34	0.99	0.8[illegible]
Burlingame	1.07	0.25	0.77	(0.21)	0.56	0.32	0.08	0.94	1.13	0.75	(2.24)	-	0.7[illegible]
Santa Rosa	1.26	0.21	0.53	0.36	0.26	0.23	0.29	0.56	0.49	0.84	1.20	1.33	0.9[illegible]
Vallejo	0.92	0.42	0.60	0.34	0.22	0.32	0.49	0.79	0.63	1.56	2.27	1.21	0.8[illegible]
Napa	2.08	0.69	0.69	0.58	0.43	0.29	0.44	0.84	1.02	1.07	1.41	1.94	0.9[illegible]

TABLE 1. QUARTERLY ATMOSPHERIC LEAD CONCENTRATIONS AT BAAQMD MONITORING STATIONS
(LEAD IN $\mu g/m^3$; Q1 = JAN, FEB, MAR; Q2 = APR, MAY, JUN, Q3 = JUL, AUG. SEP; Q4 = OCT, NOV. DEC; QUARTERS EXCEEDING 1.5 $\mu g/m^3$ UNDERLINED)

	1974				1975				1976			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
San Francisco	1.95	1.23	0.87	1.86	1.87	0.70	1.05	2.13	1.30	1.35	1.75	2.80
Fremont	-	-	-	-	-	-	-	-	0.82	0.54	0.82	1.85
San Rafael	1.56	0.91	0.39	1.09	1.47	0.53	1.04	2.24	1.78	0.77	1.15	3.21
Richmond	0.92	0.21	0.23	0.49	0.48	0.21	0.48	0.88	0.55	0.63	0.73	1.36
Pittsburg	0.53	0.30	0.32	0.30	0.32	0.18	0.46	0.61	0.82	0.30	0.45	1.36
Concord	0.61	0.22	0.39	0.56	0.62	0.22	0.46	0.91	1.13	0.55	0.80	2.26
Fremont	1.13	0.43	0.69	0.95	0.99	0.48	1.29	1.47	1.38	0.86	1.08	1.67
Livermore	0.84	0.31	0.57	1.10	0.84	0.39	0.83	1.22	1.01	0.62	0.81	1.39
San Jose	1.62	0.34	0.82	1.10	2.59	0.61	1.07	2.20	2.37	1.18	0.89	1.98
Gilroy	-	0.36	0.36	1.27	1.13	0.25	0.64	1.03	0.71	0.48	0.97	1.37
Redwood City	1.07	0.43	0.56	1.17	1.00	0.48	0.82	1.07	1.45	0.68	0.69	1.61
Burlingame	1.21	0.31	0.27	1.07	0.75	0.29	0.74	1.12	1.36	0.75	0.69	1.63
Menlo Park	0.78	0.29	0.35	0.84	0.66	0.29	0.46	1.13	0.97	0.53	0.50	1.34
[illegible]	1.31	0.34	0.40	1.33	0.66	0.37	0.65	1.64	1.02	0.59	0.55	[illegible]
Napa	1.35	0.28	0.52	1.87	1.13	0.43	0.78	1.48	1.63	0.84	0.92	1.91

	1977				1978			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
San Francisco	1.53	1.09	1.08	1.39	0.97	0.95	1.19	1.58
Fremont	1.08	0.66	0.61	1.03	0.86	0.51	0.83	1.89
San Rafael	1.76	0.79	0.96	1.14	0.82	0.63	0.79	1.39
[illegible]	0.85	0.42	0.54	0.87	0.65	0.41	0.47	1.25
[illegible]	0.51	0.29	0.37	0.67	0.50	0.23	0.36	0.75
[illegible]	1.42	0.46	0.54	1.01	0.63	0.34	0.57	1.11
[illegible]	1.46	0.58	0.86	1.46	0.74	0.52	0.94	1.00
[illegible]	1.00	0.54	0.63	1.16	0.71	0.50	0.55	0.87
San Jose	1.96	0.66	0.82	1.38	0.96	0.51	0.67	1.69
[illegible]	1.52	0.36	0.42	0.96	0.61	0.31	0.44	0.72
[illegible]	-	-	-	-	0.36	0.38	0.46	0.66
[illegible] City	1.48	0.50	0.65	0.98	0.84	0.41	0.65	1.24
[illegible]	1.71	0.56	0.64	1.07	0.81	0.54	0.63	0.80
[illegible]	1.14	0.38	0.38	0.83	0.47	0.30	0.40	0.91
[illegible]	1.06	0.46	0.45	0.68	0.53	0.29	0.41	1.02
[illegible]	1.48	0.34	0.62	1.30	0.72	0.51	0.75	1.26

Table 2. Summary of Excesses of the California Monthly and Federal Quarterly 1.5 $\mu g/m^3$ Lead Standard by Station, 1974-78.

	Months with lead > 1.5 $\mu g/m^3$	Quarters with Lead > 1.5 $\mu g/m^3$
San Francisco	21	10
Potrero (S.F.)	2	1
San Rafael	14	5
Richmond	2	1
Pittsburg	2	0
Concord	7	1
Fremont	9	1
Livermore	4	1
San Jose	15	7
Gilroy	5	1
Saratoga	0	0
Redwood City	11	1
Burlingame	6	1
Santa Rosa	2	0
Vallejo	9	2
Napa	9	2

Table 1. Summary of Exceeses of the California 1.5 μg/m³ Monthly Lead Standard by Month and Year, 1970-78.

Year	No. Station	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Station Mean.
1970	8	2	2	4	1	1	2	3	1	4	6	5	[illegible]	[illegible]	4.3
1971	10	5	[illegible]	3	1	1	1	1	0	5	4	[illegible]	[illegible]	30	3.[illegible]
1972	14	5	5	2	2	0	1	0	0	1	0	5	[illegible]	21	1.5
1973	14	3	2	1	3	0	1	0	0	1	10	3	2	26	1.9
1974	13	7	4	0	0	0	1	0	0	0	4	1	[illegible]	17	1.3
1975	14	8	1	1	0	0	0	0	1	3	[illegible]	[illegible]	[illegible]	29	2.1
1976	15	10	[illegible]2	[illegible]	1	1	0	0	0	2	6	11	[illegible]	48	3.2
1977	15	10	7	0	0	0	0	0	1	0	1	[illegible]	[illegible]	21	1.[illegible]
1978	15	0	0	[illegible]	0	0	0	0	0	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total		59	27	12	8	3	6	4	3	15	[illegible]	[illegible]	[illegible]		
Monthly Mean		5.6	[illegible]	1.3	[illegible]	0.3	0.7	0.4	0.[illegible]	1.7	[illegible]	[illegible]	[illegible]		

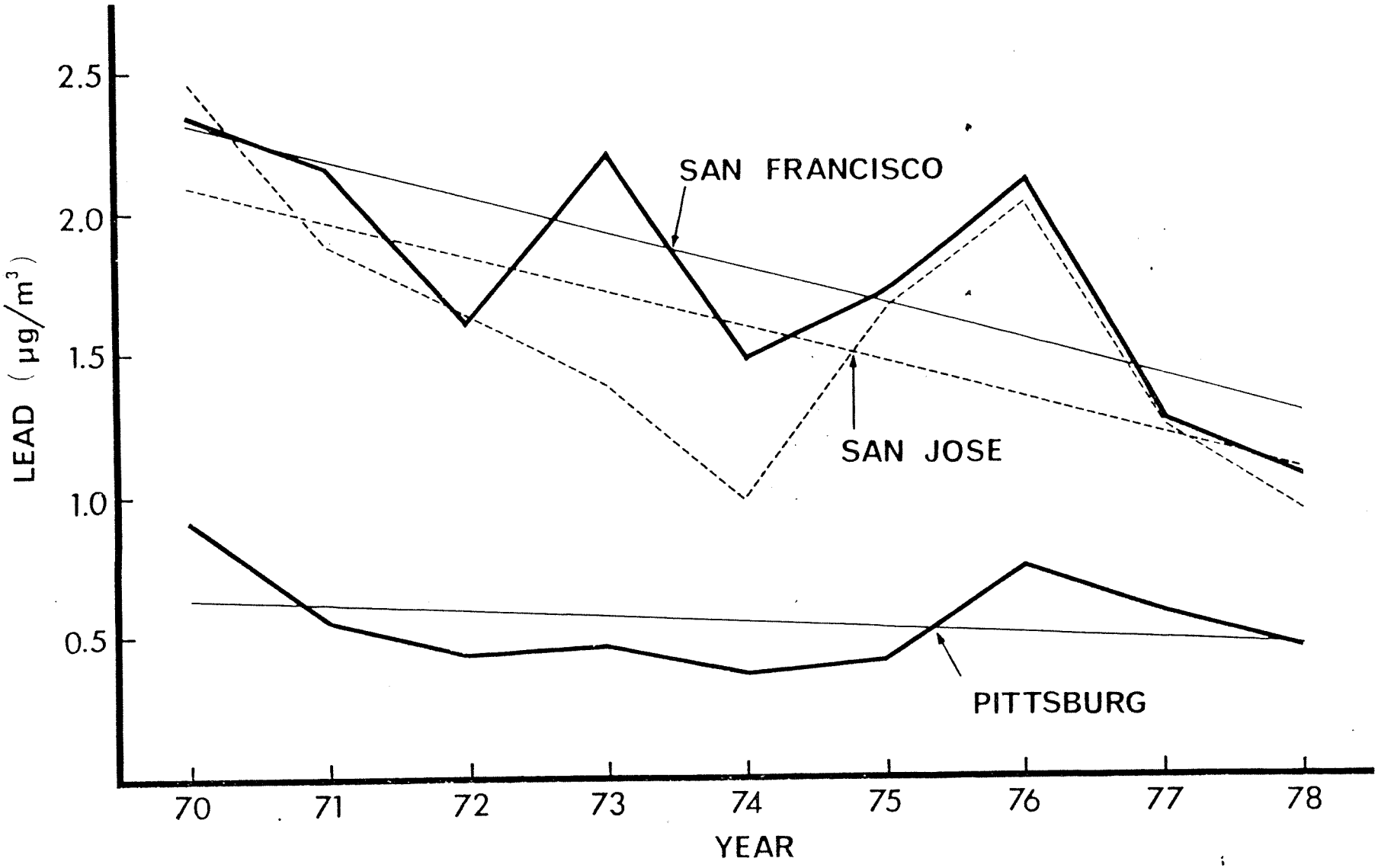


Figure 1. Jagged lines connect annual average lead values in ug/m^3 for San Francisco, San Jose, and Pittsburg. Associated straight lines indicate best-fit linear regressions. The regression lines for the traffic-saturated San Francisco and San Jose stations show a strong downtrend of .12 ug/m^3 per year, despite weather-related upturns as in 1976.